

SANTA CLARA UNIVERSITY
SCHOOL OF ENGINEERING



46TH ANNUAL

SENIOR
DESIGN
CONFERENCE

Engineering with a Mission

MAY 12, 2016

SENIOR DESIGN CONFERENCE

Dear students, alumni, parents, partners, and friends,

Welcome to the 46th Annual Senior Design Conference. We are delighted to have you with us for this exhibition of our students' work.

At the School of Engineering, our goal is to transform students' lives through distinctive engineering education that capitalizes on the convergence of the Jesuit, Catholic tradition and Silicon Valley's innovative, entrepreneurial ethos. We aspire to educate engineers who advance technological innovation and entrepreneurship in the service of humanity. Today's presentations showcase the mix of hands-on, practical experience and theoretical learning that enables our students to graduate with the knowledge, skills, and vision necessary to make a difference in their communities and in the world.

Through a wide range of capstone projects—everything from an implantable intracranial pressure sensor to a low-cost refrigerator for off-grid communities—our students have spent their senior year applying their knowledge to complex problems for the benefit of society, putting theory into practice, and in many cases, working collaboratively across disciplines.

Now in our second century of excellence in engineering education, we are ever mindful of the community of Bronco engineers who bring distinction to Santa Clara University. We congratulate our seniors for bringing their projects to fruition, and we thank those of you who have contributed to their success and to that of the School of Engineering.

Sincerely,



Godfrey Mungal, Dean
School of Engineering



PROGRAM SCHEDULE

Thursday, May 12, 2016

12 – 1:30 p.m.	Judges' Registration California Mission Room, Benson Center
12:30 p.m.	Judges' Lunch and State-of-the-School Address* Godfrey Mungal, Dean <i>School of Engineering</i> California Mission Room, Benson Center
1:45 p.m.	Judges' Welcome and Orientation Godfrey Mungal, Dean <i>School of Engineering</i> Ruth Davis, Associate Dean of Undergraduate Studies <i>School of Engineering</i> California Mission Room, Benson Center
2:15 – 5:20 p.m.	Senior Design Presentations Benson Center, Engineering Center, The Harrington Learning Commons and Orradre Library, Vari Hall
5 p.m.	Project Demonstrations Engineering Quad
6 p.m.	Dinner Locatelli Student Activity Center

** Due to space constraints, this event is open only to Conference judges and invited guests.*

SENIOR DESIGN CONFERENCE

A special thanks to Bob Fox '61 and his wife, Robin, for their support of our Senior Design Conference. Their generosity has helped many of today's design projects become a reality, and their commitment to assisting our engineering students is both valued and appreciated. The founder and president of Fox Engineering and Manufacturing, Bob is dedicated to creating practical and hands-on experiences for engineering students.

BIOENGINEERING SESSION 1

Bannan Engineering 325

Innovations in Traumatic Hemorrhage

2:15 – 2:45

**Joseph Choy, Nicholas Domek,
John Tavelli**ADVISORS: PRASHANTH ASURI,
UNYOUNG (ASHLEY) KIM,
MARYAM MOBED-MIREMADI

This project seeks to develop novel methods with which to treat serious bleeding injuries. We hope to develop an injectable device that is functional and effective at treating both internal and external bleeding moieties. We further hope to target this developed solution to rural, military, and developing world EMS systems.

Phosphate Contaminant Detection in Water through Electrochemical Biosensor

2:50 – 3:20

**Kelene Boyle, Zina Kurian,
Xitlalic Soto-Sida**

ADVISOR: UNYOUNG (ASHLEY) KIM

In order to detect phosphate contaminants in water sources and promote global health, we aim to create a portable microfluidic biosensor that will support a point-of-care platform. Through the combination of electrochemical and signal processing methods, the sensor detects the presence of phosphate analyte concentrations in water samples.

Amperometric Detection of Biogenic Amines on a Microfluidic Platform using Microchip Capillary Electrophoresis

3:30 – 4:00

**Nnaoma Agwu, Trenton Nagasawa,
Joshua Tan, Partha Vora**

ADVISORS: UNYOUNG (ASHLEY) KIM

Biogenic amines are essential neurotransmitters, which send chemical messages that operate the body on a daily basis. Our goal is to detect biogenic amines using microchip capillary electrophoresis on a microfluidic platform in conjunction with amperometric detection.

Intracranial Pressure Sensor

4:05 – 4:30

Matthew Murray, Jared Shimada

ADVISOR: EMRE ARACI

Our goal is to develop an ultrasound-read pressure sensor to be implanted along with intracranial shunts for patients who suffer from Idiopathic Intracranial Hypertension. This will provide early detection of complications associated with this condition such as clogged shunts.

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BIOENGINEERING SESSION 2

Bannan Engineering 105

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Preclinical Study for Targeted Breast Cancer Therapy

2:15 – 2:45

**Katie Bond, Jordan Karroll,
Lauren McCormick**

ADVISOR: ZHIWEN (JONATHAN) ZHANG

The purpose of our project is to test the efficacy of monoclonal antibody and small molecule drugs in reducing tumor size in a severe combined immunodeficient murine model using MDA-MB-231 human breast cancer cells.

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Comparing Small Molecule, Immunotherapy and Combination Drug Solutions for Colon Cancer

2:50 – 3:15

Mujda Alamzai, Ciara Gonzales

ADVISOR: ZHIWEN (JONATHAN) ZHANG

Cancer remains the second leading cause of death in America despite great advances in treatment research. This project will gauge the efficacy of using small molecule and antibody drugs, both alone and in combination. We will be specifically focusing on colon cancer by using a CT-26 murinae tumor model.

Exosomal Protein Engineering and Imaging

3:30 – 4:00

**Joseph Losacco, Sophie McDevitt,
Zac Stickney**

ADVISOR: BILL LU

Exosomes are subcellular vesicles with great potential for cancer therapies and targeted drug delivery. Developing systems for modification of exosomal proteins and the subsequent imaging of these vesicles could be an important platform for expanding research in this field.

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Mitigation of Radiation-Induced Bone Loss by Dried Plum

4:05 – 4:30

Carlos Medina, Sonette Steczina

ADVISOR: PRASHANTH ASURI

Working in collaboration with NASA Ames Research Center, the goals of our project are to study the molecular mechanisms by which radiation induces bone loss and by which dried plum protects bone and promotes its formation. Our findings may lead to better treatments for astronauts and patients with bone conditions.

BIOENGINEERING SESSION 3

Learning Commons 133,
Viewing and Taping B

Bolstering the *S. cerevisiae* Membrane for Efficient Bioethanol Production from Lignocellulosic Biomass

2:15 – 2:40

Matt Kubit, Conary Meyer

ADVISORS: MARYAM MOBED-MIREMADI,
TERESA RUSCETTI

Lignocellulosic biomass is the most abundant carbon source used in biofuel production utilizing yeast. Unfortunately, this material requires pretreatment resulting in the release of several inhibitors that stunt the activity of yeast. Our project is to engineer yeast to make it resilient to this harsh environment to promote sustainable energy.

Aptamer-Based Hybrid Assay for Early Stage Disease Diagnosis

2:50 – 3:15

Riley Parsons, Mari Ueno

ADVISOR: STEVEN SULJAK

Our goal is to utilize aptamers, oligonucleotides with high specificity and affinity for protein targets, to create a novel methodology based on the traditional Enzyme-Linked Immunosorbent Assay (ELISA). The ultimate goal of our project is to improve diagnostic methods for diseases, resulting in better prognoses.

Design and Validate a Synthetic Circuit for Detecting Pathway Signaling in Mammalian Cells

3:30 – 3:55

Darisha Jhutti, Nicholas Parker

ADVISORS: BILL LU,
ZHIWEN (JONATHAN) ZHANG

Synthetic circuits provide novel methods for scientists to probe mammalian cell behavior, allowing for enhanced research tools and chemical sensors. Our engineered synthetic circuit monitors outputs of an adaptable dual-reporter system which uses GFP and luciferase to allow for quantifiable and real-time measurement of the overall expression of the circuit.

Computational Design of Synthetic Antibodies for Consumer Diagnostic Tests

4:05 – 4:30

Thomas Evans, Jon Henry Therriault

ADVISOR: ZHIWEN (JONATHAN) ZHANG

A peptide with high binding affinity for a selected biomarker is chosen from a library using UCSF Chimera. An unnatural amino acid is then added that, via oxidation, forms a covalent crosslink to the peptide backbone of KLK3. The resulting high affinity peptide is then incorporated into blood testing chips.

SENIOR DESIGN CONFERENCE

BIOENGINEERING SESSION 4

Learning Commons 129,
Viewing and Taping A

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Frugal Vital Sensor

2:15 – 2:45

**Jonathan Bird, Travis McAuley,
Conor McMahon**

ADVISOR: UNYOUNG (ASHLEY) KIM

In developing nations, people suffer from inadequate healthcare due in part to the high cost of medical diagnostic equipment. Our goal is to design a frugal vital sensor system to measure a patient's blood pressure, heart rate and blood oxygen concentration, outputting the information to a terminal for diagnostic use.

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3D Printed Imaging Apparatus for Monitoring Intraocular Pressure Using Smartphone Camera

2:50 - 3:20

**Gino Castillo, Christopher Gaines,
Joshua Godfrey, Michael Zhao**

ADVISOR: EMRE ARACI

We are designing a 3D printed apparatus for a smartphone that will allow its camera to take a magnified image of an implanted intraocular lens sensor used to track changes in intraocular pressure (IOP) of glaucoma patients.

Microfluidic Device for On-Chip Quantification and Characterization of Exosomes

3:30 – 3:55

Amanda Khoo, Annemarie Mendonsa

ADVISOR: UNYOUNG (ASHLEY) KIM

Exosomes are lipid bilayer enclosed extracellular vesicles that function in cell-cell communication with promise in areas such as early cancer diagnosis and drug delivery. Our project aims to quantify and characterize exosomes within a cell on a microfluidic platform.

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Aquasift

4:05 – 4:30

**Mary Claire Schueppert,
Gaby Vazquez**

ADVISOR: UNYOUNG (ASHLEY) KIM

AquaSift is an integrated system combining a biosensor, electrical interface, and mobile application for quick, easy, and accurate evaluation of arsenic contamination in groundwater. Our biosensor employs a three-electrode system patterned with conductive ink onto a glass substrate, providing a rigid and durable platform that remains cost-effective and disposable.

Suture Passing Device for Hyoid Suspension in Sleep Apnea Surgery

4:45 – 5:15

Corbin Craven, Solomon Mulugeta, Nicholas Leavengood

ADVISOR: ZHIWEN (JONATHAN) ZHANG

We will design a medical device suitable toward ameliorating the symptoms of sleep apnea in critical patients. Our primary focus is developing a highly efficient suture passer that will successfully pass a suture around the hyoid bone, which will be simulated in cadavers and other representative tissue material.

CIVIL ENGINEERING SESSION 1

Bannan Engineering 106

Nicaragua Water Distribution System Design

2:15 – 2:40

Leah Bensching, Jamie Monk

ADVISORS: LAURA DOYLE, EDWIN MAURER

With the support of Dr. Chris Bacon in the Environmental Science Department and ASDENIC, this project explores the process of designing a water distribution system for a rural community in Nicaragua. The goal of the design is to increase efficiency and maximize access to potable water.

Regional Wastewater Facility Systems Design

2:50 – 3:20

Sage Aoki, Joseph Calvo, Kayden Haleakala, Steward Yang

ADVISOR: EDWIN MAURER

The San Jose-Santa Clara Regional Wastewater Facility's water distribution systems are currently inadequate due to age and condition. This project proposes a redesign of the potable and ground water systems through hydraulic modeling.

Green Roof Filtration and Storage System

3:30 – 3:55

Austin Rodrigues, Joel Scianna

ADVISOR: EDWIN MAURER

Our project is a design of a green roof water filtration and storage system that will both collect rainwater and recycle gray water. Our research is focused in Salinas, Puerto Rico, where water supply issues are prominent.

Cleaning Up the Dirty 530

4:05 – 4:35

Troy Lopez, Fernando Teran, Daniel Villescaz

ADVISOR: STEVEN CHIESA

Due to the recent drought, California has been realizing it is vital that we Californians carefully use what little water we have. We have designed hypothetical upgrades that can be made to a wastewater treatment facility so that its effluent stream can be recycled and used for irrigational purposes.

SENIOR DESIGN CONFERENCE

CIVIL ENGINEERING SESSION 2

Bannan Engineering 326

Habitat for Humanity Apartment Complex Redesign

2:15 – 2:45

**Megan August, Molly Bencomo,
Ashley Waite**

ADVISOR: TONYA NILSSON

This project includes the redesign of an apartment building for a Habitat for Humanity complex in Walnut Creek, CA. The initial design exceeds the building height limitation in the Walnut Creek Building Code, making a complete structural redesign of this timber structure necessary.

24th National Timber Bridge Design Competition

2:50 – 3:20

**Marie McNamara, Andrew Porter,
Martina Sbicca**

ADVISOR: TRACY ABBOTT

This timber pedestrian bridge was devised, constructed, and tested for the National Timber Bridge Design Competition. The bridge aims to showcase the reliability and cost effectiveness of timber as a viable and sustainable material in rural infrastructure.

Bamboo Roofing System for Egyptian Houses

3:30 – 4:00

**Zach Fielder, Joseph FitzPatrick,
Kathleen Scheer**

ADVISOR: TONYA NILSSON

This project provides a sustainable, affordable, and easy to construct bamboo roofing system for marginalized people in Egypt with inadequate roofs. Engineering guidelines were created for both spans and connections to accommodate houses of varying sizes. This project is a proof-of-concept for future implementation in Egypt.

Rise Above the Flood: Bridge Building in Ghana, Africa

4:05 – 4:35

**Vanessa Diaz, Ariana Govan,
Matthew Millsaps**

ADVISORS: TRACY ABBOTT,
MARK ASCHHEIM, JAMES REITES, S.J.

This project involves the design of a pedestrian footbridge for a rural village named Gambibgo, located in Northern Ghana. The bridge will let villagers safely cross a river during the flooding season in order to reach the city of Bolgatanga where they have access to jobs, clean water, and education.

CIVIL ENGINEERING SESSION 3

Bannan Engineering 107

**Foundation Design for
Multistory Building in Oakland**

2:15 – 2:40

Sean Cain

ADVISOR: SUKHMANDER SINGH

Foundation and garage-level retaining wall design for a 25-story building in Oakland.

El Camino Real BRT Redesign

2:50 – 3:15

John Garzee, Thao Nguyen-Pham

ADVISOR: RACHEL HE

Our project will be reallocating one car lane on El Camino Real to be used as a bus-only lane along with adding in a bike lane.

**Seismic Design of Interlocking
Concrete Masonry Unit Blocks**

3:30 – 4:00

**Ryan Gokey, Phil Mirenda,
Joe Papangellin**

ADVISOR: MARK ASCHHEIM

This project addresses the need for improved third world structural designs by researching mortar-less, interlocking CMU blocks. Our blocks will be constructed into a reinforced wall that we have designed, and then will be tested against earthquake-like forces.

**Analysis and Redesign of
Pruneridge Avenue from
Lawrence Expressway to
Pomeroy Avenue**

4:05 – 4:30

Tyler Isaac, Matthew Wong

ADVISOR: RACHEL HE

Our goal is to decrease the traffic density on Pruneridge Avenue between Lawrence Expressway and Pomeroy Avenue. We will analyze alternatives using manually recorded traffic data and Synchro 6 simulation software. We believe a reversible lane on Pruneridge will reduce traffic and promote pedestrian and bicyclist safety.

**COMPUTER SCIENCE AND
ENGINEERING SESSION 1**

Sullivan Engineering 618

**Looma Lesson Planning Web
Application for Education
Technology**

2:15 – 2:45

**Elise Herrmannsfeldt, Suparna Jasuja,
Kate Lassalle-Klein,
Roshan Ramankutty**ADVISORS: SILVIA FIGUEIRA,
DON RICCOMINI

The Looma Lesson Planning Application improves the usability of Looma, an off-grid computer-on-a-chip device seeking to enhance the classroom experience for children in rural Nepal. This web application organizes Looma's educational content and allows the user to create customized lesson plans.

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Fix the City

2:50 – 3:20

**Amanpreet Dhoor, Melissa Portillo,
Kevin Ta**

ADVISOR: SILVIA FIGUEIRA

This application is for the citizens of San Jose to report when city property needs fixing. Citizens can send in photos of the problem through the app, and then those reports will be sent to a web database for the city government to view.

Mobile Glaucoma Detection Application

3:30 – 3:55

Samuel Holeman, Ryan Lowe

ADVISORS: EMRE ARACI, SILVIA FIGUEIRA

Glaucoma is an asymptomatic disease that affects the lives of millions of people. If left untreated, the disease will result in loss of vision or blindness. Our application will interface with a special contact lens to help detect the common characteristics associated with glaucoma.

SaguaroTrack

4:05 – 4:30

Kirk Iserman, Christine Rohacz

ADVISOR: SILVIA FIGUEIRA

In an increasingly connected world, many employees work remotely in the field to solve issues. Employers need to keep track of employees for accountability and response time purposes. SaguaroTrack is our solution, combining a mobile application with a Web interface to allow employers to easily account for their mobile workforce.

Tanzania Education Graphing, Ranking, and Mapping

4:45 – 5:10

Travis Chen, Justin Wong

ADVISOR: MARIA PANTOJA

We are designing a website to view Tanzanian Examination Results in a visual manner. Includes graphs, ranking information, and a map. The website is optimized for different screen sizes.

COMPUTER SCIENCE AND ENGINEERING SESSION 2

Sullivan Engineering 602

Smart Photos and Object Recognition

2:15 – 2:45

**Cesaron Hernandez, Angela Laar,
Jaelin McCreary**

ADVISOR: AHMED AMER

Our product, Smart Photos, will allow users to take augmented reality photographs. This new format couples three-dimensional data with the traditional two-dimensional elements of photographs. Using Google's Project Tango, we have built a system that allows users to take Smart Photos, which capture objects in 3D and smartly labels them.

SCU Collab

2:50 – 3:15

Kevin Cai, Wesley Sha

ADVISOR: WEIJIA SHANG

SCU Collab is a mobile application that will allow students to form study groups to discuss course material and schedule meetings. Within the user groups, students can make forum posts and plan meetings.

Fitness Quest

3:30 – 3:55

Andy Chung, Avi Patel

ADVISOR: WEIJIA SHANG

Our group is developing a mobile application that combines the two aspects of health and gaming. The purpose of our project is to promote a healthier lifestyle for users and give them motivation to meet goals using a new interactive system.

TrusNet

4:05 – 4:30

Adrian Bedard, Jonathan Bedard

ADVISOR: MOE AMOUZGAR

A peer-to-peer secure networking library, designed for use in the Internet of Things.

COMPUTER SCIENCE AND ENGINEERING SESSION 3

Bannan Engineering 101

Vector Handwriting Analysis

2:15 – 2:45

Arman Elahi, Alex McAfee, Kameron Tinsley

ADVISOR: YUHONG LIU

Using parallel programming and custom vector analysis algorithms, we are making a substantial leap in authentication technology by replacing archaic passwords with modern handwriting analysis.

Globally Secured Data: A Distributed Backup System

2:50 – 3:20

Eric Beckmann, Jonathan Coon, Mikael Figueroa, Matthew Voss

ADVISOR: AHMED AMER

Are you sure your personal information is safe? Google owns your Google Drive data. Amazon Web Services has lost data of entire companies. Apple iCloud has leaked the personal data of its users. Our distributed data backup system improves privacy, reliability, and accessibility through an innovative peer-to-peer data splitting method.

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The New Grid

3:30 – 4:00

**Andrew Dobbins, Vincente Ciancio,
Steven Sanz**

ADVISOR: AHMED AMER

The New Grid is a set of mobile libraries that will allow Bluetooth data sharing between users in a mesh network without the need for underlying infrastructure. The system will include an Android app that will serve as a proof-of-concept for the effectiveness of our protocols.

Rally Up

4:05 – 4:35

Greg Fay, Michael Franco, Alex Hoff

ADVISOR: AHMED AMER

A smartwatch application with the goal of accurately locating other users with minimal face-to-screen interaction, increasing the user's awareness of their surroundings.

COMPUTER SCIENCE AND ENGINEERING SESSION 4

Sullivan Engineering 604

Uniform Validation Language

2:15 – 2:45

**Sawyer Novak, Reid Palmquist,
Douglas Parker**

ADVISOR: RONALD DANIELSON

The Uniform Validation Language is a logic language to simplify and streamline the validation process of web forms. This project will also include a web application that uses the language to provide a service for users to create and fill out forms.

Engineering Submission Portal

2:50 – 3:20

**August Beyer, Jonathan Sofer,
Joseph Villanueva**

ADVISOR: DARREN ATKINSON

We are building a submission portal for Senior Design deliverables. This will allow engineering students across all disciplines to submit their deliverables electronically.

Planly

3:30 – 3:55

Alberto Diaz-Tostado, Amy Tran

ADVISOR: DARREN ATKINSON

Planly is a collaborative project management web application that helps teams stay organized by allowing individuals to create projects, add team members, and manage their tasks.

Learnnet

4:05 – 4:30

Ryan Boals, Pat Mulloy

ADVISOR: DARREN ATKINSON

Learnnet (pronounced learn-net) is a web application to be used by the students of Santa Clara University. Users will be able to add notes and post questions to a forum, specific for each class, where they can be viewed and discussed by their classmates.

COMPUTER SCIENCE AND ENGINEERING SESSION 5

Sullivan Engineering 605

BOIP: Interactivity Platform

2:15 – 2:40

Tyler Kung, Nicholas Pulido

ADVISOR: BEN STEICHEN

An active learning platform for students at Santa Clara University. It will come in the form of a web application whose main feature will be a chatroom where students and professors can freely discuss lecture topics. Professors and students will be able to teach and learn material more effectively.

Live

2:50 – 3:20

**Griffin Cook, Samuel Kujovich,
Tyler Selewicz**

ADVISOR: YUHONG LIU

Music streaming application with realtime playlist capabilities.

enQueue

3:30 – 3:55

Michael Brikov, Phillip Nguyen

ADVISOR: BEN STEICHEN

enQueue aims to provide a method for instructors to handle requests from students during labs and order those requests in an efficient manner.

Lucem

4:05 – 4:40

**Jagjoth Bhullar, Nathan Lam,
Kenneth Pham, Adithya Prabhakaran,
AJ Santillano**

ADVISOR: BEN STEICHEN

We aim to utilize techniques such as data visualization and recommendation systems in order to supplement the traditional legal research process. We feel that the current legal field process can be greatly improved, and that it would benefit from an injection of modern technologies.

ELECTRICAL ENGINEERING SESSION 1

Learning Commons,
Training and Instruction 203

Bringing Electricity to Alafiarou: The Solar Microgrid Project

2:15 – 2:40

Jacob Leatherberry, Nicolas Metais

ADVISORS: TIMOTHY HEALY,
JAMES REITES, S.J.

97% of the 1.3 billion people who still do not have access to electricity live in Sub-Saharan Africa. To help solve this problem, our team designed and installed a solar microgrid for 133 people living in Alafiarou, Benin, so that they may see in the dark and charge their phones.

SENIOR DESIGN CONFERENCE

Infinity

2:50 – 3:15

Alejandra Huitron, Nicholas Supan

ADVISOR: TIMOTHY HEALY

The project consists of designing educational lantern kits with a solar charging system. The project will have lesson plans along with assembly of the lanterns. The kits are intended to be used by the Lightyear Foundation with high school students in Ghana, Africa.

Microphone Array

3:30 – 3:55

Aram Garibyan, Riley Stout

ADVISOR: SARAH KATE WILSON

Using a 4-channel microphone array, we are attempting to locate a sound source in a 2D plane.

Navigation and Illumination for Skateboards

4:05 – 4:30

Nathan Depew

ADVISOR: SARAH KATE WILSON

My project seeks to use LED technology to improve skateboarders' safety at night.

Smart Aquaponics System

4:45 – 5:10

Ryan Toal

ADVISOR: MICHAEL MCELFRISH

An aquaponics system with automatic light, water, and temperature control using Direct Current components for off-grid and micro-grid design flexibility.

ELECTRICAL ENGINEERING SESSION 2

Learning Commons,
Training and Instruction 205

Wireless Healthcare Monitoring System

2:15 – 2:45

Ryan Grzejka, Chan Lee, Justin Visas

ADVISOR: RAMESH ABHARI

The wireless healthcare monitoring system consists of two main parts that communicate with each other via Bluetooth connection. Information is gathered on a user or patient through several sensors. That data is then processed and sent to a user's laptop or phone where the information will be displayed.

Energy Management Control Center

2:50 – 3:20

Francis Estacio, Ren Hirokawa, Devon Quaternik, Matthew Salmanpour

ADVISOR: MARYAM KHANBAGHI

Our goal is to create a system to reduce home energy use without sacrificing comfort of the occupants. Through a control strategy, we will manipulate HVAC and appliance use to maximize overall efficiency.

Reactive Power Compensation

3:30 – 3:55

Kimberly Meyers, Martin Prado

ADVISOR: MARYAM KHANBAGHI

Our project is to create a Matlab simulation to increase the power factor of transmission lines thereby increasing the efficiency of power transmission. Apart from the simulation, a small-scale device will measure the power factor of industrial loads and output recommended changes to increase energy efficiency.

Wavefront Sensor

4:05 – 4:30

Richard Mule

ADVISORS: CHRISTOPHER WEBER, SALLY WOOD

We present a low-cost, functional wavefront sensor that can determine optical path length differences with an accuracy of 40 nm. This device can be used by future optics students to experiment with Frenzel zone plates or to measure the phase introduced by various perturbations including turbulent airflow or transparent media.

Embedded System Controller

4:45 – 5:10

Valeriano Torres

ADVISOR: SALLY WOOD

Design and implementation of an embedded system controller for an electric longboard. This project will include mounting an electric motor on the board and controlling it by means of two pressure sensors, one for each foot, so that it will speed up when the user leans forward.

INTERDISCIPLINARY SESSION 1

Learning Commons 316
St. Clare Room

MARV: Marine Autonomous Research Vessel

2:15 – 2:45

Drew Azevedo, Sam Bertram, Gregorio Del Vecchio, Ben Hopner

ADVISORS: CHRISTOPHER KITTS, SALLY WOOD

MARV is an aquatic vessel designed for hydrologic researchers to collect data from bodies of water in remote regions of the world. With help from our school and corporate sponsors, we have developed a rugged, transportable platform that minimizes input from the user by autonomously navigating unique bodies of water.

Forge: Thermoelectric Cookstove

2:50 – 3:25

Austin Jacobs, John Maffeo, Jared Sheehy, Isaac Stratfold, Matt Nelson, Bradley Ydens

ADVISORS: ROBERT MARKS, SALLY WOOD

In numerous parts of the world, necessities like adequate meal preparation or access to electricity are not available. We plan to make a cookstove for people in developing countries, that will convert excess heat from the cooking process into electricity.

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CuriPilot

3:30 – 4:00

**Gregory Cusack, Karan Daryanani,
Nathaniel Tucker**

ADVISORS: CHRISTOPHER KITTS,
SALLY WOOD

SCU computer and electrical engineers have paired up with Intel to explore the world of autopilot drones with next generation processors. Beginning with a closed loop control system for platform stabilization, we look to integrate user-controlled and altitude-locked flight.

RSL Rover: Disaster Response Vehicle

4:05 – 4:40

**Patrick Barone, Giovanni Briggs,
Aaron Burns, Zoe Demertzis,
Hesham Naja**

ADVISOR: CHRISTOPHER KITTS

The RSL Rover team upgraded a drive-by-wire Polaris ATV by integrating the industry-standard Robot Operating System (ROS) and custom sensing packages targeted at post-fire environment assessment.

STEF: Solar Thermoelectric Evaporative Fridge

4:45 – 5:20

**Daniel Avalos, Viet Huynh,
David Lyons, David Swan,
Thomas Watson**

ADVISORS: HOHYUN LEE, WEIJIA SHANG

STEF is a low power, low cost refrigerator for off-grid communities. Thermoelectric modules, a heat dissipation system, and evaporation are used to cool the refrigerator, while a

microcontroller monitors and maintains the internal temperature. A battery box powers the refrigerator, which attaches to any small solar array for off-grid power.

INTERDISCIPLINARY SESSION 2

Vari Hall,
Wiegand Room

Insula: Realtime Biophysical Music

2:15 – 2:45

**Thomas Fairman, Christopher Maier,
Mohit Nalavadi, Samuel Varney**

ADVISORS: ERIC CHAN,
TOKUNBO OGUNFUNMI, WEIJIA SHANG

Insula is the first device to create music from multiple biofeedback sensors. Our system aggregates biodata from EEG, EMG, and EKG technology into live audio-visual output. Insula paints a meaningful and holistic picture of bioinformation, enabling users to control and direct the art their bodies create.

Microfluidic *E. coli* Detection

2:50 – 3:20

**Scott Fukuoka, Andy Ly,
Andres Maldonado-Liu, Kyle Pietrzyk**

ADVISORS: UNYOUNG (ASHLEY) KIM,
ON SHUN PAK

Our project provides a method for people in developing countries to detect *E. coli* in their water sources. A microfluidic chip is used to mix a water sample with a binding agent and move it past an optical setup, where images are collected for *E. coli* concentration analysis.

Engineering an Integrated Solution for Enhancing Student Usability of 3D Bioprinters for STEAM Education

3:30 – 4:00

Andrew Chang, Sabrina Cismas, Logan Thomsen

ADVISORS: PRASHANTH ASURI, CHRISTOPHER KITTS, MARIA PANTOJA

We designed an integrated, multi-feature upgrade for desktop 3D bioprinters to extend the utility and adoption of this cutting-edge technology in the classroom. Teachers and students can more easily generate and document customizable bioprints through the use of our code generator, mobile camera system, and selection of biological experiments.

PCB Prototyping

4:05 – 4:40

Kasey Chun, Dylan Hack, Ilija Medan, Michael Rudolf, Ryan Sidley

ADVISORS: MOE AMOUZGAR, SHOBA KRISHNAN, CALVIN TSANG, ANDREW WOLFE

The goal is to design a PCB machine that allows the user to fully prototype a circuit board on one machine. This will be done by adding various toolheads and software to a robotic arm and CNC machine. This will allow engineers to fully prototype circuit boards on the spot.

Medical Screening Solution for Pregnant Women in Rural Communities

4:45 – 5:15

Blair Koeneman, Amy Miller, Joe Neumeyer, Jake Prince

ADVISORS: UNYOUNG (ASHLEY) KIM, SILVIA FIGUEIRA

This project decentralizes health services for pregnant women by integrating medical screening and web technologies into a comprehensive solution. The device analyzes urine samples for biological markers indicative of health complications, storing the results and relevant patient information to improve the consistency of healthcare for women in rural, developing communities.

MECHANICAL ENGINEERING SESSION 1

Benson Center, Williman Room

Gazelle: A Human-Powered Vehicle

2:15 – 2:45

William Fluharty, Werner Nistler, Amulya Rao, Brian Rice

ADVISOR: CALVIN TSZENG

Our goal is to create a vehicle that can be used for short distances in everyday life that is safe, affordable, and completely human powered. We want to focus on comfort of the rider and include ample amount of storage space, which makes our design very competitive with other HPVs.

SENIOR DESIGN CONFERENCE

SAFER: Search and Find for Emergencies Rover

2:50 – 3:25

Zachary Agustin, Charles Lewis, Elizabeth McMahon, Cameron Pierce, Pranav Pradhan, Michael Tamshen

ADVISOR: CALVIN TSZENG

SAFER is a remotely operated search and rescue rover for collapsed structure disasters. It will provide useful reconnaissance without risking the lives of search and rescue team members.

Gravity Charger

3:30 – 4:00

Will Gonder, Luke Lindsay, George Montgomery

ADVISOR: TIMOTHY HIGHT

Nighttime treatment and the use of small medical devices becomes difficult without reliable electricity. By harnessing the potential energy of a hanging mass, the Gravity Charger provides a reliable source of energy under any circumstances. With this reliability, medical outreach programs can better equip themselves to provide the best care.

Bangarang

4:05 – 4:40

Frank Gasztonyi, Kieran Skelly, Marshall Theyel, Jake Tierney, Connor Wilson, Brad Wyant

ADVISOR: NIK DJORDJEVIC

Aerodynamic sporting clay target system. The system launches boomerang targets that change direction midflight.

MECHANICAL ENGINEERING SESSION 2

Benson Center,
Conference Room 21

Power Flame

2:15 – 2:45

Don Bollard, Alan Johnson, Nicholas Wenzel, Peter Wilke

ADVISOR: HOHYUN LEE

Thermoelectric phone charger designed specifically for developing communities in Central America.

Cool Stove 1

2:50 – 3:20

Paola Flores, Eduardo Melendez

ADVISOR: HOHYUN LEE

Our aim is to create a reliable refrigeration solution that caters to the specific needs of individuals who live off-grid. We intend to do so by using the absorption cooler method, which we will power using the existing thermal energy emitted from a cook stove.

AquAdapt

3:30 – 4:00

Scott Jansen, Michael Simmons, Joseph Singer

ADVISOR: HOHYUN LEE

Our team's project aims to create a smart sensor that will attach to any existing residential gas or electric water heater, increasing its efficiency to match that of a state-of-the-art water heater.

MECHANICAL ENGINEERING SESSION 3

Benson Center,
Parlors B & C

Cool Stove 2

2:15 – 2:40

Robert Bernal

ADVISOR: HOHYUN LEE

Our aim is to create a reliable refrigeration solution that caters to the specific needs of individuals who live off-grid. We intend to do so by using the absorption cooler method, which we will power using the existing thermal energy emitted from a cook stove.

Torque-Auditing Test Fixture for Hansen Medical's RCM Robot

2:50 – 3:20

**Matt McKay, Byron Reins,
Scott Schneider**

ADVISOR: CHRISTOPHER KITTS

In collaboration with Hansen Medical, we are developing a torque auditing test fixture for their Remote Catheter Manipulator Robot. We seek to improve upon their current testing protocol through direct data acquisition, easily identifiable go/no-go verification, and a streamlined user experience.

Solar Panel Automated Cleaning Environment

3:30 – 4:00

**Matthew Burke, Ryan Greenough,
Daniel Jensen, Elliot Voss**

ADVISOR: ROBERT MARKS

The SPACE system seeks to maximize the energy generated from existing solar panels by removing dust and grime. Fully Autonomous, the SPACE system will provide a continuous clean at a fraction of the cost of manual labor.

GLOWS Co. Automated Chemical Etching Machine

4:05 – 4:40

**Mishan Golshan, Peter Laird,
Thomas Ostrander, Peter Savoy,
Martin Winkler**

ADVISOR: ROBERT MARKS

GLOWS Co.'s Automated Chemical Etching Machine is an industrial tool built to improve technician safety and accuracy for a fiber stripping process. It operates in a fume hood and minimizes human interactions with heated corrosive chemicals. Operating in cleanroom conditions, the tool integrates into a larger industrial laser manufacturing system.

We wish to thank the following alumni, friends, and industry partners whose participation as judges contributes greatly to the success of the Senior Design Conference.

Kishore Akshintala '14
Hewlett Packard
Enterprise

Gabriel Alcantar '08
Langan Engineering

JP Allport '15
MultiTaction

Frank Altamura '08

Geoffrey Alves '10
Space Systems Loral

Patrick Arevalo '06
Palantir Technologies

Karishma Arora '15
Fairchild Semiconductor

Cathy Avila '86
Avila and Associates

Ernesto Avila '83
Avila and Associates

Nikhil Balram
Ricoh Innovations
Corporation

Mario A. Baratta '64, '83
Baratta & Associates

Rebecca Barney '14

Aditi Bellary '15
Stanford University
School of Medicine

Daniel Beyers '15
F5 Networks

Ronald Bhuleskar '11
Workday

Melissa Bica '14
University of Colorado
Boulder

Kenneth Bigler '15
Tesla Motors

Chris Brady '98
Stanislaus County Public
Works

Derrick Breska '13
Zilka Kotab P.C.

Caroline Brooke '15
Bayside BioSciences

Kahler Pascuale Bugtong '14
Sirona Genomics

Marko Buljan '14
Marcus & Millichap

Erik Burd '05
Procept Biorobotics

Collin Burdick '11
Slalom Consulting

Mike Callan '62

Phil Carlson '74

Erik Chang '15
Cisco

Edmund Cheng '01, '06
Intuit Corp.

Sri Chilukuri '87, '95

Dan Crocker '85
Cisco

Kelsey Dedoshka '14
Hewlett Packard
Enterprise

Mike DeKlotz '89
Stellar Solutions

Shrikant Deshpande '99
Xangati, Inc.

Nagasushma Devarapalli '15

Chuck DeVita '62
Growth Process Group

Hina Dixit '12
Apple

Bill Doheny '88, '04
Chrono Therapeutics

Jackie Edem '10, '11
Lam Research

Shereen Elserougi '10
Maxim Integrated

Jimmy Erskine '13
Amazon Robotics

Nick Fong '15
Personal Capital

Michael Freitas '70
Freitas + Freitas
Engineering and Planning
Consultants, Inc.

Rob Golterman '14
Viavi Solutions

Maureen Goolkasian '85
Cornerstone Structural
Engineering Group, Inc.

Todd Goolkasian '85
Cornerstone Structural
Engineering Group, Inc.

Ronald Gorshe '75, '79

Daniel Hanna '12
Texas Instruments

Sarah Hanna '08, '10
Facebook

Ron Hansen '72

Joseph Harkins '76
Lawrence Berkeley Lab

Matthew Hart '14
Roche

Chris Hintz '98, '03
Google

Timothy Hult '83, '93
General Dynamics

Brian Janjic '89
IBM

Donald Johnson '59

Sheila Johnson '84
Lockheed Martin Space
Systems

Abby Kilkenny '15 BS, '16

Brady Knowles '10, '12
Intuitive Surgical

David Kojima '11
Blach Construction

Robert Komoto '93
American Products
International

Nonda Kozas '14
BNBT Builders

Alex Kranenburg '12
Slalom Consulting

Rahul Krishnakumar '13
Certain, Inc.

Tor Krog '12
Valve Software

Paul Krug '56, '64, '76

Shriraj Kunjir '15

Robert Lathrop '94, '01
Lathrop Engineering

Amanda Laufer '15
Turner Construction
Company

Ryan Leary '08
Opower

Frank Lee '88
GIC

Eddy Liu '15

Richard Liu '02

Dropbox

Avery Lu '95

Palo Alto Scientific, Inc.

Mark Luer '85

All American Asphalt

Rajas Malik '13

Micron Technology

Trevor Mallo '08

United States Air Force

Mark Maloney '93

Rohde & Schwarz

Joseph Mastroianni '73, '77

Diocese of San Jose

Don McIntosh '66, '69

AMD

EJ McKay '11

USAutomation

Ellen McKay '15

Blach Construction

Anthony Mei '70

US Army Corps of
Engineers

Sam Miller '99

Synopsis

Daniel Moomaw '10

Gridtential Energy

Bob Mullen '85

Mentor Graphics

Sneha Nadig '14

Advantest

William Nguyen '06

Lockheed Martin Space
Systems

Alec Nicholas '12, '13

BCA

Christine Nolan-Brady '02

Cisco Systems

Paul Nuti '93

Veritas Environmental
Consulting, Inc.

Simi Olabisi '11

Cisco

Lou Pace '83

Abbott Diabetes Care

Bobby Papadatos '01

Olympus America Inc.

Joseph Quilici '79

Silicon Valley Civil &
Structural Engineers, Inc.

Isaac Raven '15

Santa Clara Valley Water
District

Pam Rissmann '86

Dartmouth Middle School

Glenn Roberts '71

Steven Rodriggs '85

Lockheed Martin Space
Systems

Paul Russell '90

Northrop Grumman
Corporation

Neeraj Sahejpal '00

Energous

Warren Savage '93

IPextreme

Navid Shaghghi '14

Santa Clara University

Elyse Shimomura '13, '15

SutroVax, Inc.

Chrissy Shuh '13

Intuitive Surgical

Carl Simpson '75, '79

Coronis Medical Ventures

Daniel Stadulis '08

Pacific Gas & Electric

James Taguchi '11

Lillian Tatka '15

Santa Clara University

Mari Tollan '14, '15

Blach Construction
Company

Jenny Van Truong '14

Degenkolb Engineers

Tobyn VanVeghten '14

Geometrics

Kenny Vassigh '03

NASA Ames Research
Center

Ursula Vaughan '10, '12

Intuitive Surgical

Michael A. Wang '93, '97

Micron

Aaron Weast '99

Nike

Stan Whitcomb '15

Coffee Meets Bagel

Susan Whiteside '78

Whiteside and Associates

Peter Woytowitz '93

Lam Research Corp.

Xander Wroblewski '11

GoPro

Haig Yengoyan '95, '07

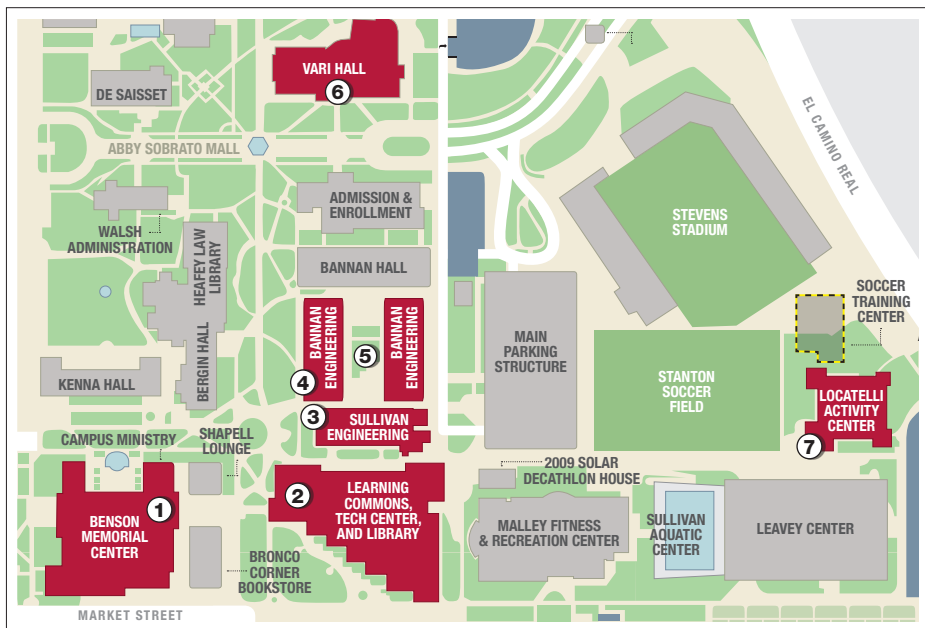
Lockheed Martin Space
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- 1 Benson Memorial Center**
- Judges' Registration
 - Judges' Lunch and State-of-the-School Address
 - Judges' Welcome and Orientation
 - Senior Design Presentations
- MECHANICAL ENGINEERING**
SESSION 1, 2, 3

- 2 The Harrington Learning Commons and Orradre Library**
- Senior Design Presentations
- BIOENGINEERING**
SESSION 3, 4
- ELECTRICAL ENGINEERING**
SESSION 1, 2
- INTERDISCIPLINARY**
SESSION 1

- 3 Sullivan Engineering**
- Senior Design Presentations
- COMPUTER ENGINEERING**
SESSION 1, 2, 4, 5

- 4 Bannan Engineering**
- Senior Design Presentations
- BIOENGINEERING**
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- 5 Engineering Quad**
- Project Demonstrations

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SESSION 2

- 7 Locatelli Activity Center**
- Dinner

